PLANT AND SOIL NEMATODES

RENIFORM NEMATODE (*ROTYLENCHULUS RENIFORMIS*), A DAMAGING PEST OF MANY CROPS IN TROPICAL AND SUBTROPICAL REGIONS OF AUSTRALIA

Root-knot and reniform nematodes are the most widespread and damaging nematode pests in tropical and subtropical climates. This fact sheet focuses on reniform nematode (*Rotylenchulus reniformis*), an important pest of many crops. *R. parvus*, which is often found at high population densities on sugarcane, is also mentioned.

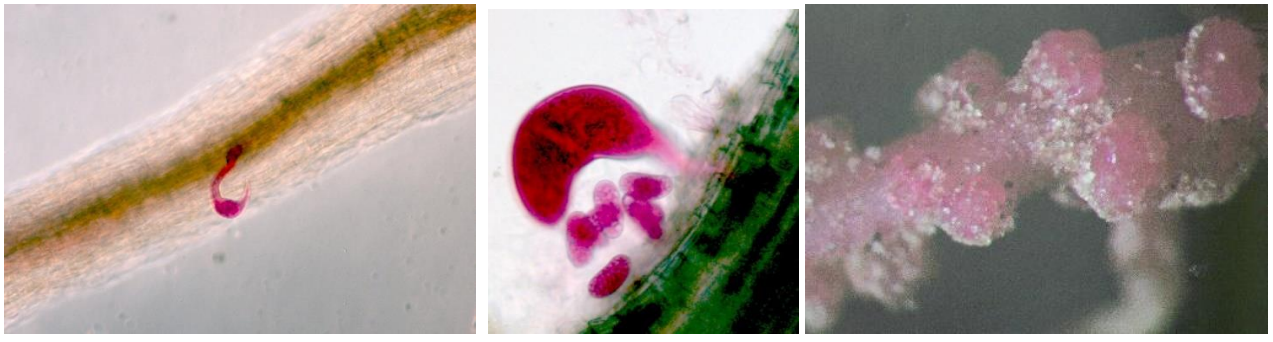
Distribution

R. reniformis occurs in the tropics, subtropics, and warm temperate regions throughout the world. It was first described in Hawaii and has since been found in the southern states of the USA, Mexico, the Caribbean, South America, the Middle East, most of Africa, India, south-east Asia, and the Pacific. In Australia, it mainly occurs in Queensland, the Northern Territory, and northern regions of WA.

There have been no formal surveys for *R. reniformis* in Australia, but in the 1980s it was largely restricted to north Queensland, with high population densities occurring on some pineapple farms. Since then, it has gradually moved south and there have been increasing numbers of detections on vegetables, initially at Bowen and then further south around Rockhampton and Bundaberg. It has also been found on cotton in the Dawson Valley, and near Emerald.

Life cycle

R. reniformis differs from most other plant-parasitic nematodes in that juveniles hatch from eggs and develop to vermiform males and immature females without feeding. The immature female then enters the root and establishes a feeding site, but most of its body remains outside the root, with the posterior part swelling and becoming kidney-shaped (hence the name reniform, which means shaped like a kidney). Each female lays 40-100 eggs which are deposited in a gelatinous matrix on the root surface. The optimum temperature for root invasion and nematode development is 27-30°C and at these temperatures, the life cycle is completed in about 3 weeks. As 5-7 generations may occur in one growing season, huge numbers of the vermiform life stages are sometimes found in the soil after a good host crop is harvested. For example, populations of 100,000 nematodes/500 mL soil have been recorded in some monocultured cotton fields in the USA.



A reniform nematode female developing in a root (left), a mature female with eggs (middle), and egg masses on the root surface that were produced by eight females (right).

Host range

More than 300 plant species are known to host *R. reniformis*, and they include many important crops and numerous widely distributed weeds. Cotton, pineapple, papaya, cowpea, soybean often suffer serious damage from reniform nematode and many vegetable crops are affected, including tomato, sweetpotato, lettuce, okra, and squash.

Management of *R. reniformis*

Very little research on reniform nematode has been done in Australia but the management options used overseas indicate the practices likely to be useful. Rotation with non-host crops is the best way of reducing populations of *R. reniformis*, and maize, peanuts and grain sorghum have proved to be the best options on cotton and soybean in the USA. Growing these crops for one year reduces the nematode population and provides some yield benefits, but yield increases are much greater with a two-year rotation.

Winter cover crops that are poor hosts of *R. reniformis* are an important component of an integrated management program because they compete with weeds, decrease soil erosion, and enhance soil health. Nematicides are also an option but are not always effective enough to reduce populations to non-damaging levels. Reniform nematode has the capacity to multiply rapidly and if low populations are present following a rotation crop, a cover crop, or a nematicide treatment, numbers may increase to very high levels by the time the following susceptible crop is harvested.

Biosecurity measures to prevent spread

As *R. reniformis* has a limited distribution in Australia, it is important that steps are taken to prevent its spread. The nematode has moved more than 1000 km south over the last 30-40 years, and as temperatures increase with climate change, environmental conditions in many areas further south will be suitable for the nematode. As nematodes are only capable of moving a few metres per year unaided, long-distance spread to new farms or regions only occurs when soil is moved on footwear, implements and vehicles. Thus, it is vital that industry bodies and biosecurity authorities warn growers that reniform nematode is a potential threat to their farming operation and encourage them to establish an on-farm hygiene program that reduces the possibility that the nematode will be introduced.

Rotylenchulus parvus

Another species of reniform nematode (*R. parvus*) also occurs in Queensland. However, when immature stages are extracted from soil and observed under a microscope, it is reasonably easy to differentiate them from *R. reniformis* because *R. parvus* does not produce males whereas they are relatively common in *R. reniformis*. Surveys have shown that *R. parvus* occurs in more than half the sugarcane fields in the Bundaberg region and is often present at population densities greater than 3,000 nematodes/200 mL soil. However, there is no evidence to indicate that this species reduces the yield of sugarcane.

Further reading

A book chapter on the interaction between *R. reniformis* and cotton provides an overview of the host range, biology, and life cycle of the nematode, explains the symptoms it produces, and covers the practices that can be included in an integrated management program.

Lawrence KS (2022) Reniform nematode (*Rotylenchulus reniformis*) and its interactions with cotton (*Gossypium hirsutum*). In *Integrated Nematode Management: State-of-the-art and visions for the future* (Eds. RA Sikora et al.) CAB International, Wallingford, Chapter 14, 94- 99.

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